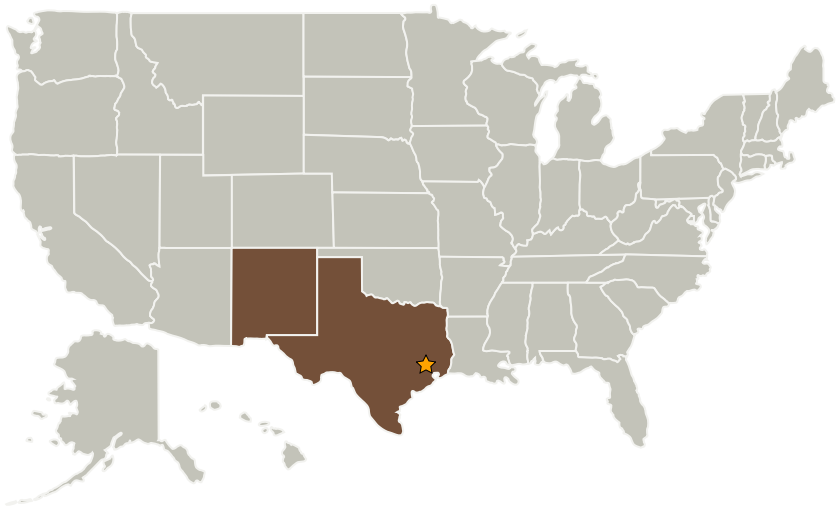
High Recovery, Low Fouling Reverse Osmosis Membrane Elements for Space Wastewater Reclamation, Phase II

Completed Technology Project (2008 - 2010)

Project Introduction

With the expected extension of duration of the space missions outlined in NASA's Vision of Space Exploration, such as a manned mission to Mars or the establishment of a lunar base, the need to produce potable water from onboard wastewater streams in a closed-loop system becomes critical for life support and health of crew membranes. Reverse osmosis (RO) is a compact process that has proven its ability to remove inorganic and organic contaminants from space mission wastewater. Our Phase I feasibility study indicate that the use of low-energy composite hollow fiber RO membranes developed at Santa Fe Science and Technology resulted in a 65-80% increase in the production of purified water compared to that obtained from the corresponding low-energy RO flat-sheet membrane without sacrificing the water quality of the permeate stream. Therefore, replacing existing spiral wound membrane elements in the RO subsystem with hollow fiber membrane elements will reduce the batch processing time or enable a lower feed pressure to be employed due to the use of higher productivity membrane elements. This will lower the overall power requirement for the RO subsystem. Phase 2 will be based on expanding the size of the membrane element in order to develop several working prototype membrane elements that can eventually be mounted in the RO subsystem of the closed-loop Integrated Water Purification System. Also during Phase 2, we will explore the use of hydrophilic polymeric coatings to determine whether it is possible to minimize the rate of membrane fouling due to the high concentration of organics in the wastewater feed stream.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Santa Fe Science and Technology, Inc.	Supporting Organization	Industry	Santa Fe, New Mexico

Primary U.S. Work Locations	
New Mexico	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.2 Water Recovery and Management